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(54) **An article coated with a pigmented thin plastics material film containing a coated titanium dioxide pigment and a process for the production of the same.**

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Description

The present invention relates to an article coated with a pigmented thin plastics material film wherein the pigment is a titanium dioxide pigment which, in order to improve its dispersibility, is coated with an inorganic substance, and to a process for preparing the same.

Titanium dioxide pigments are used in many fields, for example in the paint, plastics, and rubber industries. The effectiveness of the pigment used depends to a large extent on how evenly the pigment particles can be dispersed into the product. It is generally known that the wetting and dispersing properties of titanium dioxide pigments can be improved by depositing inorganic metal oxide and/or metal hydroxide coatings on the surface of titanium dioxide crystals. It is also known that, by treating titanium dioxide pigments with organic compounds, the dispersing properties of the pigments can be further improved. The use of the pigment determines the after-treatment which is the most advantageous.

In extrusion coating, paper, cardboard, laminate or the like is coated with a thin pigmented plastic film. In extrusion coating, the temperature of the molten plastic is 300—320°C. If a titanium dioxide pigment coated with an inorganic substance is used for pigmenting plastic, the water chemically bound in the inorganic coating is released at a high temperature, whereby holes are formed in the coating film (so-called lacing phenomenon). In extrusion coating, the thickness of the plastic film is 25—50 μm and its TiO_2 concentration is 10—15%.

High requirements are set on the dispersibility of pigment, since in thin plastics films the undispersed pigment agglomerates show as spots, and unevenly dispersed pigments result in surfaces of irregular color. Furthermore, in most cases the optimum effect of the pigment is not utilized to the full extent. Since a very good dispersibility is required of the pigment, inorganically after-treated pigments should be used in extrusion coating, but owing to the lacing phenomenon, nowadays, only titanium dioxide pigments which have not been inorganically after-treated are used in extrusion coating.

The object of the present invention is to use a titanium dioxide pigment coated with an inorganic substance, eliminating the above-mentioned disadvantages.

The main characteristics of the invention are given in accompanying Claim 1.

According to the invention, the inorganic coating used for the after-treatment of calcinated titanium dioxide pigment is so thin that the water chemically bound in it does not cause lacing.

The superiority of the pigment used in the invention over inorganically uncoated pigments previously used in extrusion coating lies in its better dispersibility. The rate of production can be improved by using a well dispersing pigment for the production of so-called master batches.

The pigment used in the present invention also provides the advantage that the same pigment can be used not only for extrusion coating but also for other applications in which titanium dioxide pigment is used for coloring plastics.

The inorganic metal oxide and/or metal hydroxide coating of titanium dioxide pigment produced according to the invention is very thin compared with the coatings of titanium dioxide pigment commonly used. The total amount of inorganic coating must not exceed 0.5% by weight, and an advantageous addition of coating, expressed as metal oxide, is 0.05—0.5% of the weight of the pigment. The inorganic coating of pigments produced used in the invention can be deposited on the surface of the pigment crystals during the after-treatment stage from any water-soluble metal compound commonly used for the production of titanium dioxide pigment, such as water-soluble compounds of aluminum, zinc, titanium, zirconium or magnesium, or mixtures of the same. A suitable aluminum compound is aluminum sulfate, but aluminate solutions can also be used. Zinc, magnesium and zirconium can be added in the form of sulfates, but other water-soluble compounds are also possible. Titanium can be added as titanyl sulfate or titanium tetrachloride. Inorganic coating chemicals are usually added in the form of solutions, but they can also be added as solids, as long as they are in soluble form during at least one treatment stage.

The process can be applied to titanium dioxide pigments produced by any process. They can be produced by highly different processes, such as the sulfate process or the chloride process. The process can be applied to both rutile and anatase. When so desired, organic substances can also be used for coating titanium dioxide pigments in addition to an inorganic coating. Such substances include long chain fatty acids and their salts, organic silicon compounds, alcohols, polyalcohols, and amines.

The following properties of pigments used according to the invention were determined:

1. Removal of water chemically bound in the inorganic coating of titanium dioxide pigment, at different temperatures

10 g of pigment is weighed into a tared quartz crucible which has been annealed at 600°C. The crucible with the pigment is transferred into an aging oven, in which it is kept at 105°C for 16 h, then cooled in an exsiccator, and weighed. Thereafter the pigment is kept in the aging oven at 200, 300, 400 and 500°C for 2 hours in such a manner that after each heating stage the crucible with the pigment is cooled in an exsiccator and weighed. The weight loss of the pigment at the different tem-

peratures is calculated in percent of the dry weight obtained at 105°C.

If an organic substance has also been added to the coating of the pigment, its proportion of the weight loss need not be taken into account, if a constant amount of the same organic substance has been added to all the experimental pigments.

2. Dispersibility of the pigment in PVC plastic

The dispersibility of pigment in PVC plastic is tested by a so-called paste PVC whitening capacity test, according to the following instructions:

A PVC paste is prepared by adding 37.5 g of epoxy softener and 12.5 g of organic Sn stabilizer to 1150 g of dioctyl phthalate with the aid of a Lenart laboratory mixer (LENART mikromix, type EWTH, Paul Vollrath, Cologne). The mixture of dioctyl phthalate and stabilizer is cooled, and 2400 g of polyvinyl chloride powder is added to it. The slow rotations of the Lenart mixer are used to avoid heating up the paste.

A black toning paste is prepared by mixing 300 g of dioctyl phthalate, 300 g of polyvinyl chloride and 15 g of coal black by means of a Lenart mixer using slow rotation. The paste must not heat up during the mixing. After an aging time of at least 24 h, the paste is passed twice through a triple-roller machine (Drais-Vollhydraulische Dreiwalzenmaschine, type DH, Grösse 3, Draiswerke GmbH, Mannheim-Waldhof).

A black PVC paste is prepared by mixing 3600 g of PVC paste and 205 g of a black toning paste by means of a Lenart mixer. The paste must not heat up during the mixing.

The dispersibility of titanium dioxide pigment in PVC paste is tested by weighing 152 g of black PVC paste, prepared as above, into a 500-ml steel decanter and by adding to it slowly 5.0 g of the titanium dioxide pigment to be tested, and by mixing it by means of a Lenart mixer (400 r/min). After the adding stage, the mixing is continued at the same rotation speed for two minutes, whereafter the speed is increased (960 r/min) and mixing is continued for one more minute. Thereafter, the paste is passed through a triple-roller machine. Plastic sheets are drawn from the pastes obtained by Lenart mixing and from the triple-rolled pastes, using as an aid a polished-edge glass pane and 0.25-mm-thick steel strips on tin-coated metal sheets attached to a magnetic table. The sheets are gelled at 175°C for 3 min in an aging oven provided with a blower. The degree of whiteness and the tone of the plastic sheet surfaces are measured using a Hunterlab Colorimeter (type D25D-3A, manufacturer Hunterlab, 9529 Lee High Way, Fairfax, Virginia 22030) with color measuring filters X, Y and Z. The numerical value obtained with colorimeter filter Y expresses the whiteness of the sheet measured. Thus, a high Y value indicates high dispersibility. Expression YI, calculated from the values measured using filters X, Y and Z, was used as a color index which describes the color tone of the pigment.

The invention is described below in greater detail with the aid of examples and with reference to the accompanying drawings, in which

Figure 1 depicts the weight loss of a titanium dioxide pigment coated with aluminum sulfate, in percent, as a function of the temperature;

Figure 2 depicts the weight loss of a titanium dioxide pigment coated with a mixture of titanyl sulfate and magnesium sulfate, in percent, as a function of the temperature;

Figure 3 depicts the weight loss of a titanium dioxide pigment coated with a mixture of zirconium sulfate and magnesium sulfate, in percent, as a function of the temperature;

Figure 4 depicts the weight loss of a titanium dioxide pigment coated with zinc sulfate, in percent, as a function of the temperature; and

Figure 5 depicts the weight loss of a titanium dioxide pigment coated with magnesium sulfate, in percent, as a function of the temperature.

In Figures 1—5, the weight loss of a titanium dioxide pigment after-treated in accordance with the invention, as a function of the temperature, is compared with the weight loss of a titanium dioxide pigment which has not been after-treated with a metal compound.

Example 1a

A calcinated rutile titanium dioxide pigment was dry ground and dispersed in water, and the aqueous dispersion was ground in a sand grinder. The concentration of TiO_2 in the sand-ground pigment slurry was 200 g/l.

The pigment slurry was heated to 50°C. Acidic aluminum sulfate solution was added to the slurry in an amount corresponding to 0.1% Al_2O_3, calculated from the amount of TiO_2 in the slurry. During this addition, the pH of the slurry dropped to 2.5. The slurry was neutralized by means of a sodium carbonate solution to a pH value of 7.5. After the neutralization, the treated titanium dioxide pigment was recovered by filtration. The filter cake was washed with water from which salts had been removed by means of an ion exchanger. 0.35% dimethyl polysiloxane, calculated from the TiO_2, was added to the washed filter cake. The pigment was dried in an aging oven at 105°C for 16 h and ground in a steam jet mill. An analysis of 0.10% Al_2O_3, calculated from the weight, was obtained from the dried and jet-ground pigment.

Examples 1b—1d

Pigments were prepared as in Example 1a, but aluminum sulfate solution was added in amounts corresponding to 0.3, 0.5 and 1.0% Al_2O_3, calculated from the amounts of TiO_2 in the slurry. 0.35% dimethyl polysiloxane, calculated from the TiO_2, was added to all the pigments of the example, as in Example 1a. Analyses of 0.29, 0.49 and 0.96% Al_2O_3, respectively, calculated from the weight of the

pigment, were obtained from the dried and jet-ground pigments.

The pigments prepared in Examples 1a—1c are in accordance with the invention, whereas Example 1d, in which 1.0% Al_2O_3 was deposited in the coating of the pigment, is a reference example.

The removal of the water chemically bound in the inorganic coating of the pigments prepared in Examples 1a—1d, at different temperatures, was studied gravimetrically using the above-mentioned determination method. The reference pigment used was a titanium dioxide pigment manufactured by the chloride process and not after-treated with an inorganic substance. Figure 1 shows graphically the heat loss of the pigments prepared in Examples 1a—1d, as a function of the temperature. It can be seen from the figure that the heat loss of the inorganically after-treated pigments prepared in Examples 1a—1d, at different temperatures, is less than that of the reference pigment not coated with an inorganic pigment, when the Al_2O_3 coating is 0.5% or less, calculated from the weight of the pigment.

Examples 2a—2c

Pigments were prepared as in Example 1a, but aluminum sulfate solution was added in amounts corresponding to 0.25, 0.5 and 1.0% Al_2O_3, calculated from the TiO_2 amount in the slurry. 0.35% dimethyl polysiloxane, calculated from the TiO_2, was added to all the pigments of the example, as in Examples 1a—1d. Analyses of 0.23, 0.49 and 0.90% Al_2O_3, calculated from the weight of the pigment, were obtained from the dried and jet-ground pigments.

The pigments prepared in Examples 2a—2b are in accordance with the invention, whereas the pigment prepared in Example 2c, in which 1.0% Al_2O_3 was deposited in the coating, is a reference example.

The dispersibility of the pigments prepared in Examples 2a—2c in PVC plastic was tested using the above-mentioned dispersibility test. The reference pigment used was the same titanium dioxide pigment, not after-treated with an inorganic substance, as above. It can be observed from the results of Table 1 that the dispersibility properties of the inorganically coated pigments are considerably better than those of the reference pigment not coated with an inorganic substance.

Master batches containing pigment 50% by weight and polyethene 50% by weight were made from pigments prepared according to Examples 2a—2c and polyethene. The reference pigment used was the above-mentioned titanium dioxide pigment not after-treated with an inorganic substance. It was observed in connection with the preparation of the master batches that the inorganically coated pigments dispersed better in plastic than did the reference pigment, and so the production capacity could be increased when using pigments prepared according to Examples 2a—2c.

Dry mixtures with a TiO_2 concentration of 12.5% by weight were prepared from the master batches described above and unpigmented polyethene. Using the dry mixtures, a trial run was carried out with an extrusion coating machine; in the trial run, paper was coated with pigmented polyethene. In the coating trial runs, the speed of the paper was 100 and 200 m/min and the amount of polyethene coating was 10 and 20 g/m². On the basis of the results obtained in the trial runs, the pigments according to the invention, prepared as in Examples 2a—2b, are suitable for extrusion coating, but the pigment prepared according to Example 2c, in which the Al_2O_3 concentration in the coating is 0.90% calculated from the weight of the pigment, is not suitable for extrusion coating because of lacing. Furthermore, it was observed from the trial run results that, when the pigments according to the invention were used, a whiter final product was obtained in the extrusion coating, and the final product had fewer burls caused by pigment agglomerates than the reference pigment had. This result shows that pigments prepared in accordance with the invention disperse better in polyethene than does a reference pigment not coated inorganically. The results obtained in extrusion coating experiments regarding dispersibility and lacing agree with the results obtained in the paste PVC whitening capacity experiment and weight loss experiment.

Examples 3a—3b

Pigments were prepared as in Example 1a, but, instead of aluminum sulfate solution, titanyl sulfate was added in amounts corresponding to 0.1 and 0.45% TiO_2, calculated from the amount of TiO_2 in the slurry. Before the pigment slurry was filtered, magnesium sulfate solution was added to both pigments of the example in an amount corresponding to 0.08% MgO, calculated from the amount of TiO_2 in the slurry. Part of the magnesium sulfate dissolves when the filter cake is washed, and so an analysis of 0.03% MgO, calculated from the weight of the pigment, was obtained from the dried and jet-ground pigment. 0.35% dimethyl polysiloxane was added to each pigment of the example, as in Examples 1a—1d.

Examples 4a—4b

Pigments were prepared as in Examples 3a—3b, but, instead of titanyl sulfate solution, zirconium sulfate solution was added in amounts corresponding to 0.1 and 0.45% ZrO_2, calculated from the amount of TiO_2 in the slurry. Before the pigment slurry was filtered, magnesium sulfate solution was added to each pigment of the example in an amount corresponding to 0.08% MgO, calculated from the amount of TiO_2 in the slurry, as in Examples 3a—3b. Dimethyl polysiloxane was also added

to each pigment of the example in an amount of 0.35%, calculated from the amount of TiO_2. Analyses of 0.03% MgO and 0.10 and 0.45% ZrO_2, calculated from the weight of the pigment, were obtained from the dried and jet-ground pigments.

TABLE 1

Effect of Al_2O_3 coating deposited during the after-treatment stage on the dispersibility of titanium dioxide pigment in PVC plastic

		Hunterlab measurements							
		Lenart mixed				Triple-rolled once			
Example	Al_2O_3 %	Y	X	Z	YI	Y	X	Z	YI
2a	0.23	23.16	22.40	31.80	−22.14	23.53	22.75	32.60	−23.44
2b	0.49	23.28	22.51	32.07	−22.60	23.69	22.90	32.91	−23.87
2c	0.90	23.22	22.45	32.06	−22.99	23.40	22.63	32.45	−23.62
Reference pigment		22.28	21.58	30.18	−19.97	22.48	21.77	30.60	−20.70

Examples 5a—5c

Pigments were prepared as in Example 1a, but, instead of aluminum sulfate solution, zinc sulfate solution was added in amounts corresponding to 0.1, 0.4 and 0.5% ZnO, calculated from the amount of TiO_2 in the slurry. Dimethyl polysiloxane was added to all pigments of the example in an amount of 0.35%, calculated from the amount of TiO_2. Analyses of 0.10, 0.40 and 0.50 ZnO, respectively, calculated from the weight of the pigment, were obtained from the dried and jet-ground pigments.

Example 6

Pigment was prepared as in Example 1a, but, instead of aluminum sulfate solution, magnesium sulfate solution was added in an amount corresponding to 0.2% MgO, calculated from the amount of TiO_2 in the slurry. Dimethyl polysiloxane was also added, in an amount of 0.35% as in Example 1a. An analysis of 0.05% MgO, calculated from the weight of the pigment, was obtained from the dried and jet-ground pigment, and thus most of the deposited MgO had been leached out when the filter cake was washed.

The pigments prepared in Examples 3—6 are all in accordance with the invention.

The removal of the water chemically bound in the inorganic coating of the pigments prepared in Examples 3—6 was studied gravimetrically at different temperatures by the determination method described above. The reference pigment used was the above-mentioned titanium dioxide pigment not inorganically after-treated. The results are shown in Figures 2—5. It can be seen from the figures that the weight loss of the inorganically after-treated pigments in accordance with the invention, prepared in Examples 3—6, is less at different temperatures than that of the reference pigment not inorganically coated.

The dispersibility in PVC plastic of the pigments prepared in Examples 3—6 and Example 1a—all of which are in accordance with the invention—was tested using the above-mentioned dispersibility test. The reference pigment used was titanium dioxide pigment not inorganically after-treated, but a different batch than in the dispersibility test illustrated in Table 1. It can be seen from the results shown in Table 2 that the dispersibility properties of all the inorganically coated pigments prepared in accordance with the invention in Examples 3—6 and Example 1a are considerably better than those of the reference pigment not inorganically coated.

TABLE 2
Effect of inorganic coating deposited during the after-treatment stage on the dispersibility of titanium dioxide pigment in PVC plastic

Example	Al_2O_3 %	TiO_2 %	ZrO_2 %	ZnO %	MgO %	Hunterlab measurements: Lenart mixed Y	X	Z	YI	Triple-rolled once Y	X	Z	YI
1a	0.10					22.59	21.90	30.80	−20.81	23.60	22.88	32.35	−21.52
3a		0.10			0.03	22.45	21.78	30.71	−21.24	23.60	22.88	32.48	−22.16
3b		0.45			0.03	22.47	21.80	30.79	−21.47	23.76	23.03	32.72	−22.27
4a			0.10		0.03	22.19	21.58	30.99	−23.91	23.34	22.69	32.74	−24.63
4b			0.45		0.03	22.22	21.60	31.04	−24.04	23.24	22.60	32.67	−24.90
5a				0.10		22.44	21.76	30.58	−20.74	23.67	22.95	32.43	−21.53
5b				0.40		22.54	21.85	30.71	−20.74	23.86	23.14	32.66	−21.30
5c				0.50		22.47	21.78	30.60	−20.67	23.55	22.84	32.23	−21.33
6					0.05	22.28	21.66	30.93	−23.13	23.35	22.69	32.60	−23.98
Reference pigment						21.21	20.59	28.87	−20.43	22.19	21.54	30.53	−21.96

Claims

1. An article coated with a pigmented thin plastics material film containing a titanium dioxide pigment, characterized in that the titanium dioxide pigment is coated with not more than 0,5%, preferably 0,05—0,5% by weight of the pigment of an inorganic compound, expressed as oxide.

2. An article according to claim 1, characterized in that the coating to the pigment consists of an oxide or hydroxide of aluminum zinc, titanium, zirconium, and/or magnesium, its total amount being expressed as Al_2O_3, ZnO, TiO_2, ZrO_2, or MgO, respectively.

3. An article according to claim 1 or 2, characterized in that the coating to the pigment also contains an organic substance, such as long chain fatty acids and their salts, organic silicon compounds, preferably dimethyl polysiloxane, alcohols, and polyalcohols.

4. A process for preparing a coated article according to claims 1 to 3, by adding to an aqueous slurry of calcinated titanium dioxide pigment a water-soluble inorganic compound or an inorganic compound which can be brought to a water-soluble form in the slurry, depositing it on the titanium dioxide pigment, dispersing the coated pigment particles in a plastics material and coating the article with the pigmented plastic as a thin film, characterized in that the inorganic compound is added to the titanium dioxide pigment slurry in an amount which, expressed as oxide, is not more than 0,5%, preferably 0.05—0.5% by weight of the titanium dioxide pigment.

5. A process according to claim 4, characterized in that a compound of aluminum zinc, titanium, zirconium, and/or magnesium, or an aqueous solution of such a compound, is added to the titanium dioxide pigment slurry.

6. A process according to claim 5, characterized in that aluminum sulfate, expressed as Al_2O_3, is added to the pigment slurry in an amount of 0.1—0.5% by weight of the pigment.

7. A process according to claim 5, characterized in that titanyl sulfate or titanium tetrachloride, expressed as TiO_2, is added to the pigment slurry in an amount of 0.1—0.45% by weight of the pigment.

8. A process according to any of claims 4 to 7, characterized in that an organic substance, such as long chain fatty acids and their salts, organic silicon compounds, preferably dimethyl polysiloxane, alcohols and polyalcohols, is also added to the pigment slurry.

9. The use of a thin plastics material film containing a titanium dioxide pigment coated with not more than 0,5%, preferably 0.05—0.5% by weight of the pigment of an inorganic substance expressed as oxide, for coating an article.

Patentansprüche

1. Gegenstand, überzogen mit einem pigmentierten dünnen Film aus Kunststoffmaterial, enthaltend ein Titandioxid-Pigment, dadurch gekennzeichnet, daß das Titandioxid-Pigment mit nitch mehr als 0,5% vorzugsweise 0,05—0,5%, bezogen auf das Gewicht des Pigments, einer anorganischen Verbindung, ausgedrückt als Oxid, überzogen ist.

2. Gegenstand nach Anspruch 1, dadurch gekennzeichnet, daß der Überzug für das Pigment aus einem Oxid oder Hydroxid von Aluminium, Zink, Titan, Zirconium und/oder Magnesium besteht, und seine Gesamtmenge als Al_2O_3, ZnO, TiO_2, ZrO_2 bzw. MgO ausgedrückt ist.

3. Gegenstand nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Überzug für das Pigment auch eine organische Substanz enthält, wie langkettige Fettsäuren und ihre Salze, organische Silicium-Verbindungen, vorzugsweise Dimethyl-polysiloxan, Alkohole und Polyalkohole.

4. Verfahren zur Herstellung eines überzogenen Gegenstands nach Anspruch 1 bis 3, durch Zusatz zu einer wäßrigen Aufschlämmung von calciniertem Titandioxid-Pigment von einer wasserlöslichen anorganischen Verbindung oder einer anorganischen Verbindung die in der Aufschlämmung in eine wasserlösliche Form gebracht werden kann, deren Abscheidung auf dem Titandioxid-Pigment, Dispergieren der überzogenen Pigmentteilchen in einem Kunststoffmaterial und Überziehen des Gegenstands mit dem pigmentierten Kunststoff als dünner Film, dadurch gekennzeichnet, daß die anorganische Verbindung zu der Titandioxid-Pigment-Aufschlämmung in einer Menge gefügt wird, die, ausgedrückt als Oxid, nicht mehr als 0,5%, vorzugsweise 0,05—0,5%, bezogen auf das Gewicht des Titandioxid-Pigments, beträgt.

5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß eine Verbindung von Aluminium, Zink, Titan, Zirconium und/oder Magnesium oder eine wäßrige Lösung einer derartigen Verbindung zu der Titandioxid-Pigment-Aufschlämmung gefügt wird.

6. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß Aluminiumsulfat, ausgedrückt als Al_2O_3, zu der Pigmentaufschlämmung in einer Menge von 0,1—0,5 Gew.-% des Pigments gefügt wird.

7. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß Titanylsulfat oder Titantetrachlorid, ausgedrückt als TiO_2, zu der Pigmentaufschlämmung in einer Menge von 0,1—0,45 Gew.-% des Pigments gefügt wird.

8. Verfahren nach einem der Ansprüche 4 bis 7, dadurch gekennzeichnet, daß eine organische Substanz wie langkettige Fettsäuren und ihre Salze, organische Silicium-Verbindungen, vorzugsweise Dimethyl-polysiloxan, Alkohole und Polyalkohole ebenfalls zu der Pigmentaufschlämmung gefügt wird.

9. Verwendung eines dünnen Films aus Kunststoffmaterial, der ein Titandioxid-Pigment

enthält, das mit nicht mehr als 0,5%, vorzugsweise 0,05—0,5%, bezogen auf das Gewicht des Pigments, einer anorganischen Substanz, ausgedrückt als Oxid, überzogen ist, zum Überziehen eines Gegenstands.

Revendications

1. Objet recouvert d'une mince pellicule de matière plastique pigmentée contenant un pigment de dioxyde de titane, caractérisé en ce que le pigment de dioxyde de titane est revêtu avec au plus 0,5%, de préférence 0,05—0,5% en poids du pigment d'un composé inorganique, exprimé sous la forme de l'oxyde.

2. Objet selon la revendication 1, caractérisé en ce que le revêtement du pigment se compose d'un oxyde ou hydroxyde d'aluminium, de zinc, de titane, de zirconium et/ou de magnésium, sa quantité totale étant exprimée sous la forme de Al_2O_3, ZnO, TiO_2, ZrO_2, ou MgO, respectivement.

3. Objet selon l'une des revendications 1 ou 2, caractérisé en ce que le revêtement du pigment contient également une substance organique, comme des acides gras à longue chaîne et leurs sels, des composés de silicium organique, de préférence du diméthyl-polysiloxane, des alcools, et des polyalcools.

4. Procédé pour préparer un objet revêtu selon les revendications 1 à 3, par addition à une bouillie aqueuse de pigment de dioxyde de titane calciné d'un composé inorganique soluble dans l'eau ou d'un composé inorganique que l'on peut amener sous une forme soluble dans l'eau dans la bouillie, dépôt de ce composé sur le pigment de dioxyde de titane, dispersion des particules de pigment revêtues dans une matière plastique et revêtement de l'objet avec la matière plastique pigmentée sous la forme d'une mince pellicule, caractérisé en ce qu'on ajoute le composé inorganique à la bouillie de pigment de dioxyde de titane en une quantité qui, exprimée sous forme d'oxyde, ne dépasse pas 0,5%, de préférence 0,05—0,5% en poids du pigment de dioxyde de titane.

5. Procédé selon la revendication 4, caractérisé en ce qu'on ajoute à la bouillie de pigment de dioxyde de titane un composé d'aluminium, de zinc, de titane, de zirconium et/ou de magnésium, ou une solution aqueuse d'un tel composé.

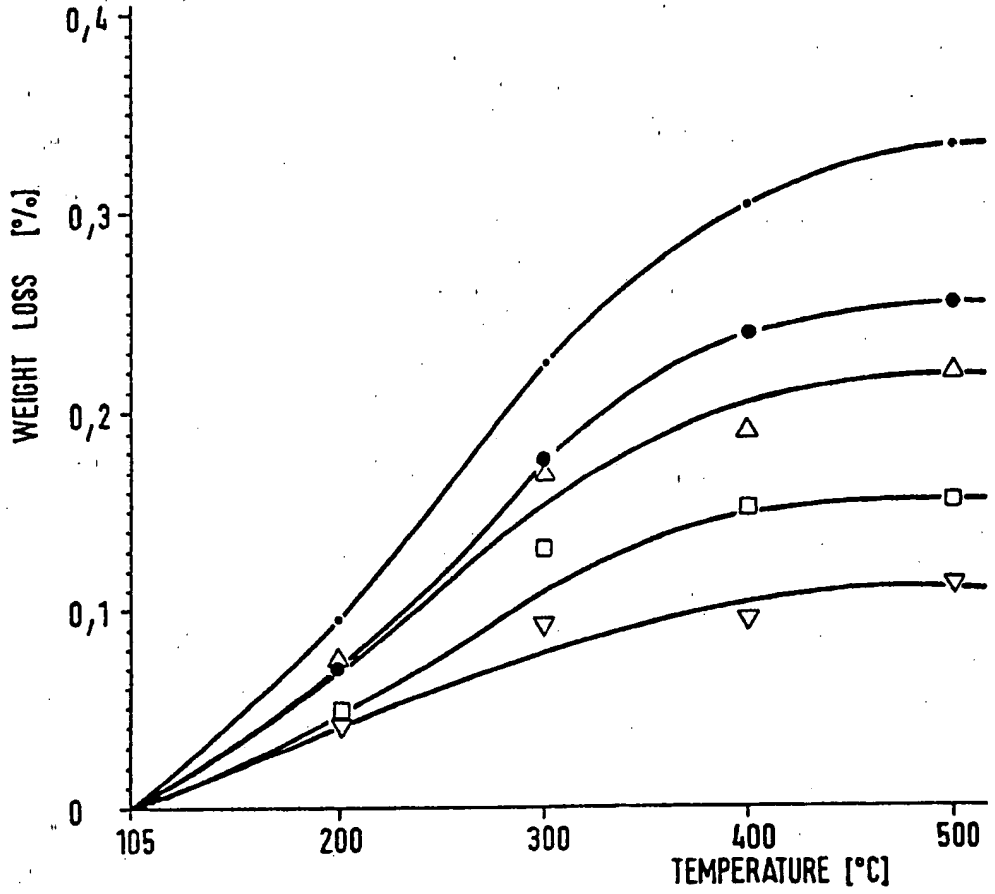
6. Procédé selon la revendication 5, caractérisé en ce qu'on ajoute à la bouillie de pigment du sulfate d'aluminium, exprimé sous forme d'Al_2O_3, en une quantité de 0,1—0,5% en poids du pigment.

7. Procédé selon la revendication 5, caractérisé en ce qu'on ajoute à la bouillie de pigment du sulfate de titanyle ou du tétrachlorure de titane, exprimé sous forme de TiO_2, en une quantité de 0,1—0,45% en poids du pigment.

8. Procédé selon l'une quelconque des revendications 4 à 7, caractérisé en ce qu'on ajoute également à la bouillie de pigment une substance organique, comme des acides gras à longue chaîne et leurs sels, des composés de silicium organiques, de préférence du diméthylpolysiloxane, des alcools et des polyalcools.

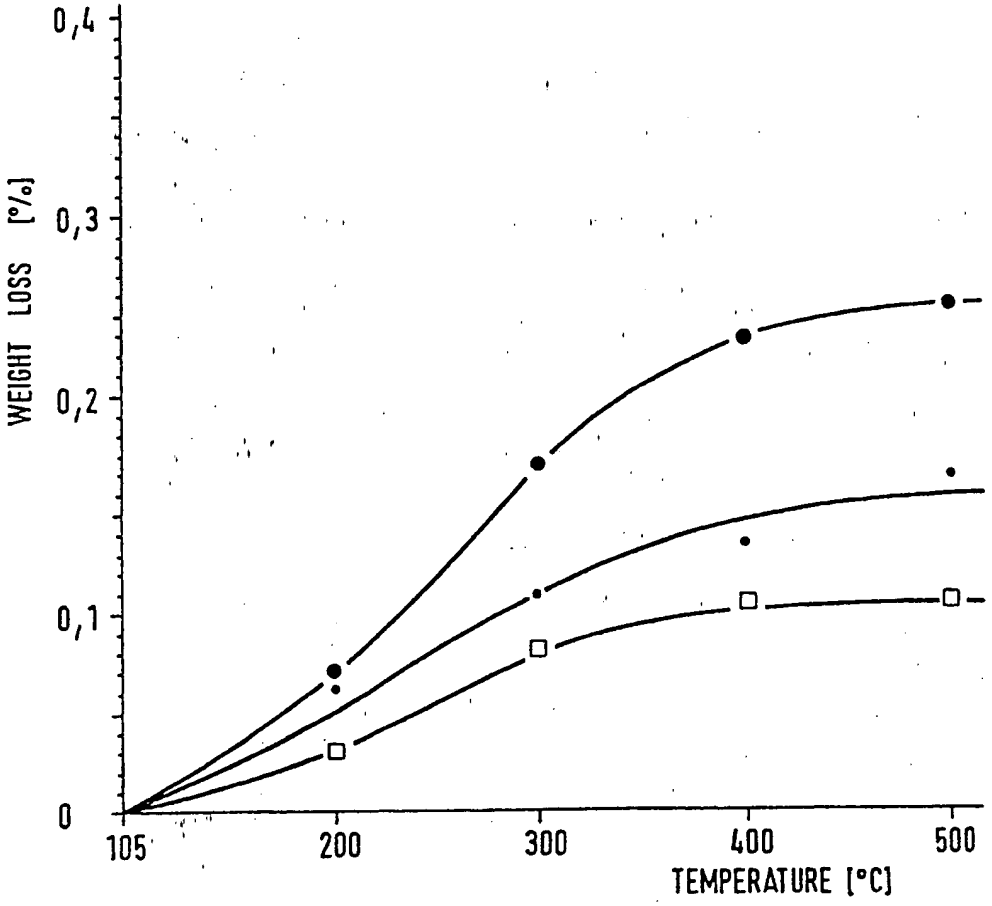
9. Application d'une mince pellicule de matière plastique contenant un pigment de dioxyde de titane revêtu avec au plus 0,5%, de préférence 0,05—0,5% en poids du pigment d'une substance inorganique, exprimée sous forme d'oxyde, pour recouvrir un objet.

Fig. 1



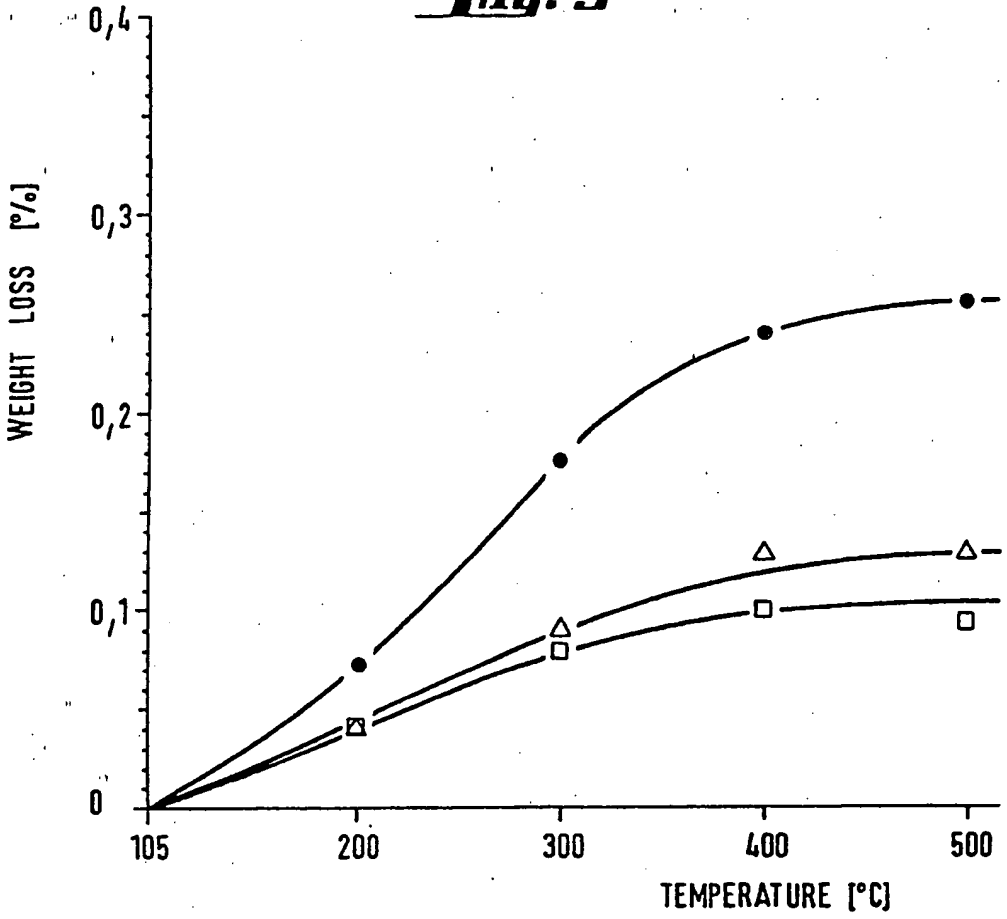
- • 1,0 % Al_2O_3 , EXAMPLE 1d
- △ 0,5 % Al_2O_3 , EXAMPLE 1c
- □ 0,3 % Al_2O_3 , EXAMPLE 1b
- ▽ 0,1 % Al_2O_3 , EXAMPLE 1a
- ● COMPARED PIGMENT

Fig. 2



- • 0,45 % TiO_2 + 0,03 % MgO , EXAMPLE 3b
- □ 0,10 % TiO_2 + 0,03 % MgO , EXAMPLE 3a
- ● COMPARED PIGMENT

Fig. 3

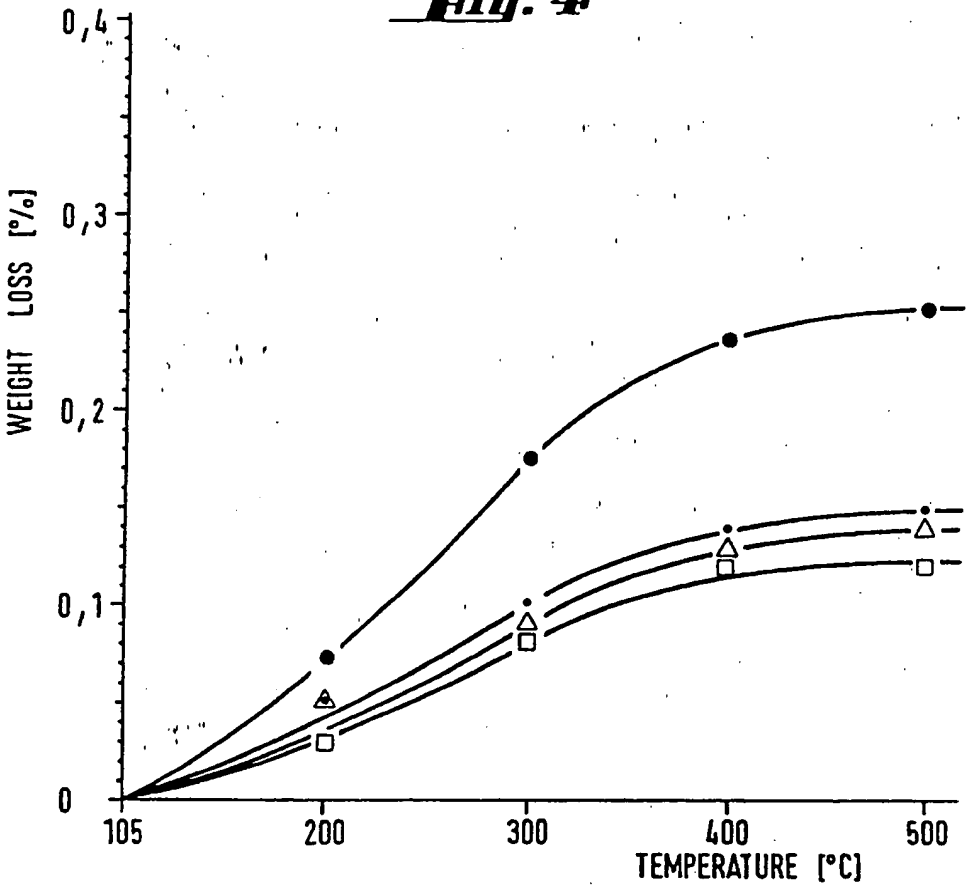


△ 0,45 % ZrO_2 + 0,03 % MgO , EXAMPLE 4b

□ 0,10 % ZrO_2 + 0,03 % MgO , EXAMPLE 4a

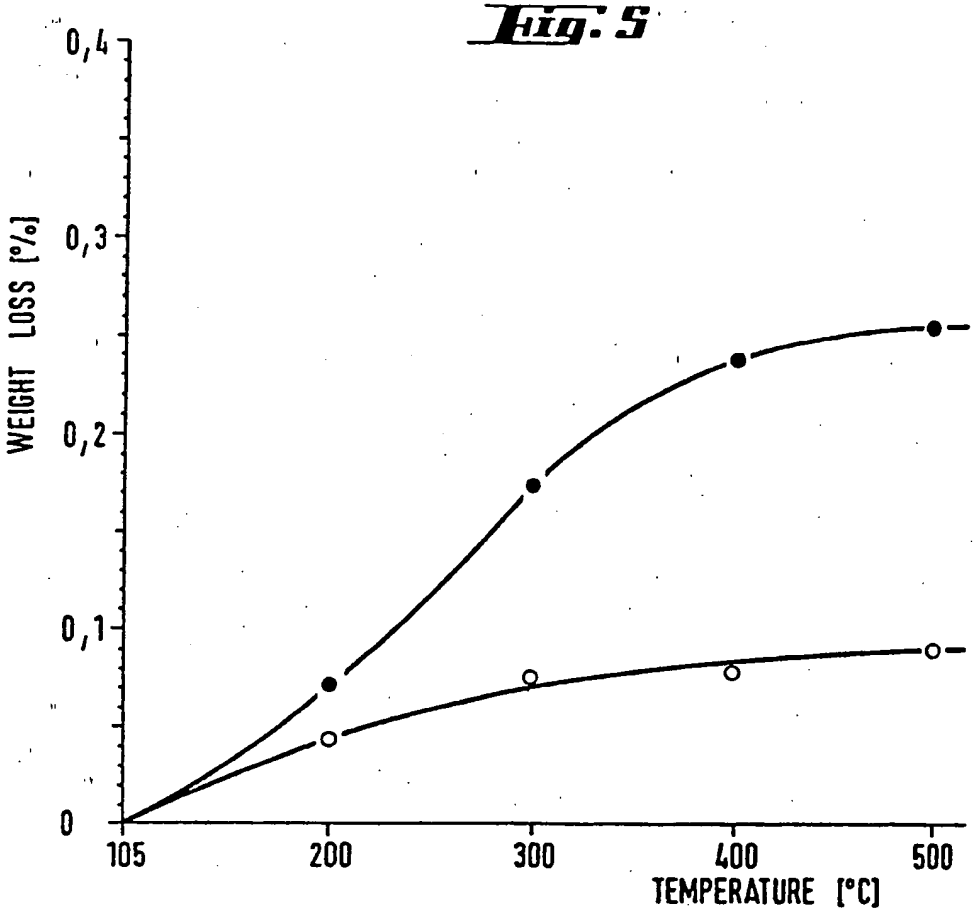
● COMPARED PIGMENT

Fig. 4



- • 0,50 % ZnO , EXAMPLE 5c
- △ 0,40 % ZnO , EXAMPLE 5b
- □ 0,10 % ZnO , EXAMPLE 5a
- ● COMPARED PIGMENT

Fig. 5



○ 0,05 % MgO , EXAMPLE 6

● COMPARED PIGMENT